



Usability Evaluation of a Web-Based Rabbit Reproduction Recording System for Smallholder Farmers: An ISO 9241-11:2018 Approach

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Abstract: Reproductive recording is essential for effective rabbit breeding management, yet manual systems often hinder breeding stock selection at the smallholder level. This study developed a rabbit livestock recording website using The Five Planes framework and evaluated its usability under ISO 9241-11:2018 across effectiveness (success rate and error rate), efficiency (task completion time), and satisfaction (System Usability Scale/SUS). Testing was conducted in two iterative phases involving animal science students and active rabbit farmers as respondents. Phase I (5 respondents) yielded a success rate of 86.25%, an error rate of 11%, an efficiency of 53.05 seconds per task, and a SUS score of 63.50 (Marginal High). Following interface improvements, Phase II (20 respondents) recorded a success rate of 74.38%, an error rate of 12%, an efficiency of 66.91 seconds per task, and a SUS score of 66.13 (Marginal High). This decline is primarily attributable to the inclusion of farmer respondents with more heterogeneous digital literacy in Phase II, rather than a deterioration in system design. These findings indicate that while The Five Planes framework produced a functionally robust recording website, further refinement is needed to improve usability for users with lower digital literacy before broader implementation in smallholder rabbit farming.

Keywords: ISO 9241-11; Recording website; Usability testing

Introduction

The rabbit farming sector holds strategic potential for supporting national food security due to the high nutritional value of rabbit meat and its rapid reproductive cycle. According to a study by Bahar et al. (2016), rabbit meat contains 18.7 to 20.1% protein, which is higher than chicken (18.6%) and beef (16.3%). Additionally, it has a low fat content of 6.2% (Marhaeniyanto & Susanti, 2017). The primary advantage of this commodity lies in its high biological productivity. A female rabbit can give birth up to 10 times a year, with a litter size of 8–10 kits per birth (Prianto et al., 2017). Rabbits also grow very rapidly,

Bahar et al. (2016) explain which reaching weaning weight in a short time and an adult weight of 3-5 kg. However, this rapid reproductive rate poses a unique challenge for farmers if not balanced with proper data management.

Ideal livestock management relies heavily on recording activities, which include livestock identification, pedigree, and production and reproduction data (Pari, 2018). Recording data is the foundation for determining livestock breeding stock quality, such as evaluating litter size, mortality, and service per conception. Without accurate data, breeding stock selection is often conducted manually and subjectively, leading to the neglect of important genetic

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parameters (Rahayu et al., 2019). Unfortunately, the implementation of recording at the smallholder level remains very limited. Chaniago et al. (2019) reveal that recording often fails to be effective because manual recording methods are considered burdensome, time-consuming, and difficult to analyze by farmers who have limited time and resources.

The main challenge faced is not merely the lack of technology, but rather the mismatch between existing technology and the characteristics of its users. Farmers in rural areas often have varying levels of digital literacy (Kurniawan et al., 2023; Sofian et al., 2023; Zamista & Azmi, 2023). This challenge is not unique to livestock recording systems; studies of digital extension tools across Sub-Saharan Africa, South Asia, and Southeast Asia have similarly found that usability, literacy, and accessibility barriers frequently constrain farmers' engagement with digital agricultural tools, regardless of the specific technology involved (Coggins et al., 2022). Likewise, evidence from smartphone-based agricultural applications indicates that adoption and effective use among smallholder farmers are strongly shaped by exposure and prior familiarity with digital tools rather than by system functionality alone (Kolapo & Didunye, 2024), while a systematic review of mobile agricultural service applications in Sub-Saharan Africa found that perceived ease of use – closely tied to user-friendliness and low cognitive effort – remains a decisive factor in sustained adoption among farmers with limited digital experience (Muromba et al., 2025).

Livestock management applications designed without considering usability are at high risk of being rejected or failing to gain adoption, a pattern also observed in other smallholder livestock development studies that emphasize institutional strengthening but rarely address the usability of the digital tools involved (Asminaya et al., 2026; Haq et al., 2023). Systems that are too complex, interfaces that are confusing, or inefficient workflows will cause farmers to revert to manual methods or abandon record-keeping altogether. Therefore, digitizing livestock record-keeping is not enough by simply building system functionality; it must ensure that the system is learnable, efficient, and satisfying for users.

Existing research on digital livestock recording systems has predominantly focused on evaluating production performance outcomes rather than the usability of the systems themselves (Resti et al., 2024) and formal usability evaluation frameworks such as ISO 9241-11:2018 remain rarely applied to small-scale livestock recording systems – particularly for rabbits, whose digital recording literature is considerably more limited compared to dairy cattle or poultry.

Moreover, existing usability studies in this domain typically rely on academic or expert users as respondents, leaving a gap in understanding how such systems perform when tested directly by end-users with heterogeneous digital literacy, such as smallholder farmers in the field mirroring a broader tendency in other technical and vocational domains where digital learning and monitoring tools are prioritized for functional development over formal usability evaluation (Sukardjo et al., 2023).

To address this gap, this study develops a web-based information system for recording rabbit reproduction using The Five Planes framework (Deaton, 2003), which organizes the development process into five progressive layers – strategy, scope, structure, skeleton, and surface – ensuring that every design decision is grounded in the actual needs of rabbit farmers as end-users. The system's success is evaluated not merely through its operational features, but through a comprehensive usability assessment based on ISO 9241-11:2018, covering three dimensions: effectiveness (operationalized through success rate and error/defective rate), efficiency (time-based task completion), and satisfaction (System Usability Scale) (Wibawa et al., 2019).

The three usability components defined in ISO 9241-11:2018 – effectiveness, efficiency, and satisfaction – have been widely adopted as the standard framework for evaluating interactive systems, with recent methodological reviews reaffirming their continued relevance for capturing usability as an outcome of interaction rather than a fixed product attribute (Bevan et al., 2015). Among the available instruments for measuring the satisfaction dimension, the System Usability Scale (SUS) remains the most widely used and psychometrically validated tool, having demonstrated strong reliability across nearly a decade of empirical application (Bangor et al., 2008) and continuing to be recommended as a robust measure of perceived usability in more recent reviews (Lewis, 2018). Testing further involves real, active rabbit farmers alongside animal science students as respondents, allowing the resulting usability findings to more accurately reflect actual field conditions rather than controlled academic settings alone.

The novelty of this study therefore lies in its combination of a structured design framework (The Five Planes) explicitly grounded in end-user needs; a formal, standards-based usability evaluation (ISO 9241-11:2018) rarely applied to small-scale livestock recording systems; and direct field testing involving real smallholder farmers rather than academic users alone – an approach that, to date, remains scarcely documented in the rabbit livestock recording literature.

This research is therefore important not only to fill this specific literature gap, but also to provide a replicable evaluation model that can guide the development of usable, field-ready digital recording tools for smallholder livestock farmers more broadly.

Method

System Development

This study employs The Five Planes framework developed by Deaton (2003) as the system development approach. The Five Planes organizes the development process into five progressive layers: strategy, scope, structure, skeleton, and surface. At the strategy plane, user needs and research objectives were identified through field observations and interviews with rabbit farmers (Fachridwan & Sondari, 2023). At the scope plane, functional and content requirements were defined based on the identified needs. At the structure plane, the information architecture and interaction flow of the system were designed (Hardiansyah et al., 2019). At the skeleton plane, interface layouts, navigation patterns, and input mechanisms were developed into wireframes. Finally, at the surface plane, the visual design was refined into a high-fidelity prototype ready for usability testing (Achmad et al., 2021). This layered approach ensures that every design decision is grounded in the actual needs of rabbit farmers as end-users, enabling the system to be both functionally complete and contextually appropriate for use in the field. This staged development and evaluation approach parallels research and development models applied to other digital information systems, such as the 4D model used to evaluate an Android-based learning outcomes reporting system (Efendi & Jati, 2023) and black-box testing techniques used to verify the functional reliability of a digital counseling website (Maryanti et al., 2023; Sarjono, 2018).

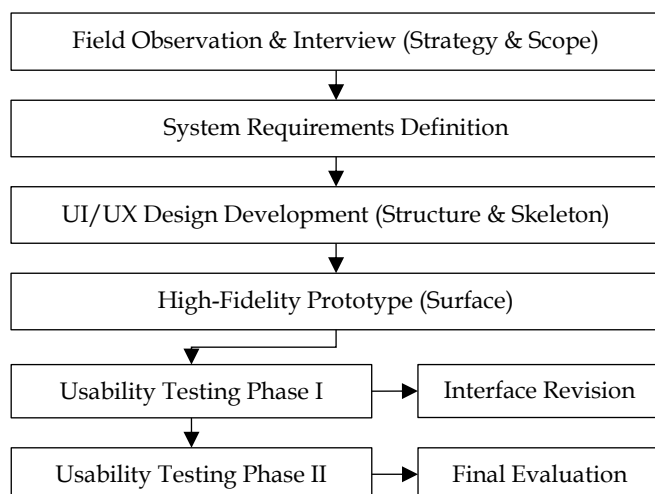


Figure 1. System development

Understanding the Context and User Needs

The initial phase was conducted through field observations and interviews with groups of rabbit farmers in Malang Regency, Batu City, Blitar Regency, and Trenggalek Regency. The identification process focused on farmers' habits regarding record-keeping, physical constraints in the rabbit hutches (such as lighting or having dirty hands while working), and their level of digital literacy. The results of this identification were used to formulate system requirements, such as the need for a simple interface, large navigation buttons, and a minimalist data input flow.

Design Solution Development

The design solution was developed based on the farmers' requirements gathered through interviews, followed by user interface design. The system was built as a web-based application using the Next.js framework for the frontend and MongoDB as the database, deployed via the Vercel platform to ensure fast access via farmers' mobile devices (smartphones). The design was developed as a High-Fidelity Prototype ready for testing (Septiadi & Sukmawati, 2025).

Evaluation

The evaluation was conducted in two phases involving a total of 25 respondents. The first phase involved 5 respondents consisting of animal science students, intended to test the initial design; feedback and challenges identified during this phase were analyzed to facilitate interface improvements. The second phase involved 20 respondents, consisting of seven active rabbit farmers and 13 animal science students, conducted to test the revised design and measure improvements in the website's usability performance following the Phase I revisions.

The sampling technique used was purposive sampling, with the criteria that respondents had a background in animal husbandry and varying levels of technological proficiency (Guntoko et al., 2017).

Usability Testing Metrics

Usability evaluation in this study refers to the ISO 9241-11:2018 standard, which defines usability as the extent to which a system, product, or service can be used by specified users to achieve specified goals with effectiveness, efficiency, and satisfaction in a specified context of use. Based on this framework, the three dimensions were operationalized into four measurement metrics. Effectiveness was broken down into two sub-components: success rate, which measures the completeness with which users achieve their goals on first use, and error, which measures the accuracy with which users achieve their goals without making

mistakes. Efficiency was measured through time-based task completion as the primary resource indicator. Satisfaction was assessed through users' cognitive and emotional responses using the System Usability Scale (SUS) questionnaire (Wibawa et al., 2019). This approach parallels prior ISO 9241-11-based usability testing on web-based platforms, where effectiveness, efficiency, and satisfaction were likewise measured through task completion scenarios combined with the SUS questionnaire (Arthana et al., 2019).

Success Rate

Success rate measured based on respondents in completing the main tasks on the first attempt without the instructor's assistance. The success rate is determined using the following equation below.

$$\text{Success rate} = \frac{(S + (P \times 0.5))}{\text{Total task}} \times 100\% \quad (1)$$

(Kusumawardhana et al., 2019)

Notes:

S = number of tasks completed successfully without assistance

P = number of tasks completed successfully with assistance or minor errors

Error

Determining the error rate aims to measure the number of mistakes made by users while interacting with the system. Errors can occur due to pressing the wrong button or confusion in menu navigation. The error aspect can be measured using the following equation.

$$\text{Defective rate} = \frac{\text{Total mistakes}}{\text{Total opportunity}} \times 100\% \quad (2)$$

(Kusumawardhana et al., 2019)

Efficiency

Efficiency is measured using the Time on Task parameter, which is the average time (in seconds) required by respondents to complete a livestock data recording task scenario. A shorter time indicates better design efficiency (Pramono et al., 2019). The efficiency value can be determined using the following equation.

$$\text{Time base efficiency} = \frac{\sum_{f=1}^R \sum_{t=1}^N \frac{n_{ij}}{t_{ij}}}{NR} \quad (3)$$

(Kusumawardhana et al., 2019)

n_{ij} = number of successful task completions by respondent ion task j

t_{ij} = time (in seconds) taken by respondent ito complete task j

N = total number of tasks

R = total number of respondents

Satisfaction

User satisfaction is measured subjectively using the System Usability Scale (SUS) questionnaire. This questionnaire consists of 10 statements on a 1-5 Likert scale. The final SUS score is calculated using a standard formula, yielding a score range of 0-100, which is then categorized into Acceptability Ranges and a Grade Scale. The SUS score is determined using the following criteria.

$$\begin{aligned} \text{Odd-numbered question scores} &= \text{Score} - 1 \\ \text{Even-numbered question score} &= 5 - \text{score} \end{aligned} \quad (4)$$

Thus, the SUS score formula is:

$$\text{SUS Score} = (\sum(Q_i - 1) + \sum(5 - Q_j)) \times 2.5 \quad (5)$$

(Putra, 2023)

Notes:

Q_i = questions on odd-numbered items (1, 3, 5, 7, 9)

Q_j = questions on even numbers (2, 4, 6, 8, 10)

After determining each respondent's score, the next step is to calculate the average SUS score for all respondents using the following equation.

$$X = \frac{\sum x}{n} \quad (6)$$

(Ardhana, 2022)

Notes:

X = average score

$\sum x$ = sum of scores on the system usability scale

n = number of respondents

The average score obtained is then compared with the SUS scale to determine the rating category. An information system is considered good if the SUS score is above 68.

The testing was conducted using the Task-Based Usability Testing method. Respondents were asked to perform a series of tasks representing the main activities within the system. The task scenarios included creating an account and logging into the system, adding a new cage, and adding new parent data. Respondents were then asked to use the search feature via the QR code scanner, schedule breeding, and record actual matings. The remaining scenarios involved performing pregnancy checks through palpation and evaluating the productivity of breeding rabbits.

Result and Discussion

Participant Profiles and Testing Scenarios

The usability testing was conducted in two phases with different respondent characteristics to identify performance gaps between academic users and real-world users in the field. The first phase involved 5 respondents—students from the Faculty of Animal

Science who tended to have high digital literacy – while the second phase involved 20 respondents consisting of 7 smallholder farmers and 13 students from the Faculty of Animal Science. The inclusion of farmers in this phase aimed to test the design's resilience against real-world constraints in the field, including farmers' cognitive and motor skills.



Figure 2. Analysis of farmers needs through interviews

Phase I Usability Test Results



Figure 3. Phase I usability testing with animal science students

Table 1. Scenario task

Phase I Task Details	Phase II Task Details
Create a new account and log in with that account	The user is redirected to the dashboard
Add a new cage	The cage appears in the list
Adding one new female livestock to the created pen	The livestock appears in the list
Search for livestock using the QR code feature	The user will be redirected to the livestock being searched for
Add a breeding schedule by entering "breed livestock" in the agenda title	The breeding schedule will appear in the "agenda" menu
Record livestock mating	The user finds the "check palpation" agenda in the "agenda" menu
Mark the palpation results as "positive"	The estimated due date (EDD) will appear
Conduct an evaluation to determine the quality of the dam	The user views the results of the dam quality analysis

Usability is a crucial parameter in evaluating the ease of access to a system's interface for users. The usability assessment in this study is based on four main criteria: success rate, efficiency, errors, and satisfaction. The testing procedure was implemented by providing respondents with a series of task scenarios to simulate real-world usage in the field. During this interaction process, data regarding task completion success rates, error frequency, and execution time were systematically recorded. The evaluation phase concluded with a measurement of respondents' satisfaction perceptions using the System Usability Scale (SUS) questionnaire to obtain a subjective assessment of the quality of the recording website interface. Details of the task scenarios are presented in Table 1.

Success Rate

The results of the Phase I usability testing are as follows.

Table 2. Phase I usability test results

Measurement Aspect	Result
success rate	86.25%
Efficiency	0.0188 goals/second 53.05 seconds/goal
Error	11%
Satisfaction	63.50 (marginal high)

The success rate test in Phase I yielded a score of 86.25%. This result indicates that the majority of respondents were able to understand the basic logic of the recording website to complete the assigned task on the first interaction. Although the basic structure of the system was understood, this result remains below the findings of Defriani et al. (2021) (96%) and is broadly comparable to the findings of Kusumah et al. (2019) (86%), indicating that the system's success rate falls within a range consistent with prior usability studies of similar web-based applications. Referring to the Ministry of Home Affairs Research and Development standard (1991), a score of 86,25% places the recording website in the "very effective" category, indicating that the system has met the minimum standards for operational feasibility but has not yet reached an optimal level.

Table 3. Effectiveness standards

Value range (%)	Category
< 40	Very ineffective
40–59.99	Ineffective
60–79.99	Moderately effective
≥ 80	Very effective

Source: Effectiveness Standards by Home Affairs Research and Development standard (1991, as cited in Putri et al., 2021)

The "very effective" category was driven by familiarity with the content, where the use of everyday farming labels and technical terms successfully minimized initial cognitive barriers for users. Despite achieving this category, a 13.75% task failure rate was identified, caused by respondents' lack of understanding of specific terminology such as "parity" and an overly cluttered interface layout. Navigation challenges on the evaluation page and the QR scanner feature necessitate simplifying the workflow and providing visual reinforcement for action buttons to further optimize success rate in subsequent testing phases.

Error

Defective rate in Phase I yielded a value of 11%. This figure represents the probability of an operational error occurring each time a respondent completes a task. The majority of errors identified were typing errors (typos) and navigation errors in task scenarios with high input complexity. The third task scenario (T3), namely the addition of new female livestock data, was recorded as the source of the most errors because it required the detailed and precise entry of livestock identification information.

An analysis of failures in Task T3 revealed that the primary issue stemmed from inconsistencies in the format of manually entered data. Respondents tended to enter dates in the day/month/year format, which reflects the standard convention used in Indonesia, while the system's input field required the month/day/year format. This mismatch indicates a design flaw rather than a user error, as the system failed to accommodate the local date format convention familiar to Indonesian users. This finding highlights the importance of aligning input field formats with users' established mental models and regional conventions in subsequent development iterations.

Efficiency

Efficiency measurement in Phase I was conducted using a time-based efficiency approach to calculate the ratio between task completion success and the time allocated by respondents. The results showed an efficiency value of 0.0188 goals/second, which, when converted, is equivalent to 53.05 seconds to complete a full task. Referring to the views of Sauro & Lewis (2016), there are no fixed rules for determining the ideal speed threshold because this value is highly dependent on the context of the system being developed. Therefore, this achievement of 53.05 seconds serves as an initial indicator of interaction time load and a benchmark for system performance before the interface revision process is carried out.

The efficiency of using the livestock recording website is determined not only by execution speed but is also influenced by the accuracy of instruction interpretation. A critical finding was identified in the sixth task (T6) regarding livestock mating records, where all respondents achieved only the "partial success" category. The results of the investigation through interviews revealed ambiguities in the instructions between scheduling in the fifth task (T5) and actual recording in the sixth task (T6). The emergence of double meanings regarding the agenda function caused cognitive barriers for respondents in distinguishing between the procedures for inputting schedules and the actual mating in the field. This challenge underscores the need for simplifying workflows and ensuring clarity in the terminology used in the navigation menu to optimize the system's operational efficiency.

Satisfaction

Measurement of user satisfaction using the System Usability Scale (SUS) in Phase I yielded an average score of 63.50. Based on the SUS rating scale, this score falls into Grade D, categorized as Marginal High. This result indicates that although the recording website is functionally usable, the respondents' satisfaction level remains below the global average of 68. This score suggests that the user experience in operating the system has not yet reached an optimal level, necessitating further evaluation of the existing interface elements.

These low subjective ratings were identified as stemming from interaction difficulties in several task scenarios, particularly in the livestock breeding scheduling instructions (T5). Instructions that were perceived as overly complex and unintuitive had a direct impact on respondents' perception of the system's ease of use. These findings provide a strong foundation for comprehensive improvements focused on simplifying visual instructions and restructuring the interface design. Design optimization at this stage is a crucial step toward enhancing user comfort before proceeding to the second phase of testing, which involves livestock farmers in the field.

Recommendations for Improvement

At the end of the first phase of the usability test, unstructured interviews were conducted to gather feedback and suggestions following the users' first experience with the website. The feedback and suggestions received were then filtered and addressed. The suggestions that were implemented, along with detailed follow-up actions, are presented in Table 4.

Table 4. Feedback and follow-up from Phase I usability testing

Feedback	Follow-up
Respondents did not fully understand the meaning of "parity"	Provide a brief explanation of parity
Date entry in livestock records is still done manually	Date entry is now done using a calendar
Inclusion of livestock photos to facilitate identification	Added option to upload livestock photos
The QR scanner feature automatically uses the front camera	Providing usage guidelines
Confusing instructions on T5 and T6	Instruction improvements

Phase II Usability Test Results

The results of objective parameter measurements show a change in performance between Phase 1 and Phase 2, as presented in Table 5.

Table 5. Results of Phases 1 and 2

Measurement	Results	
Aspect	Phase 1	Phase 2
Success rate	86.25%	74.38%
Error	11%	12%
Efficiency	0.0188 goals/second 53.05 seconds/goal	0.014 goals/second 66.91 seconds/goal
Satisfaction	63.50 (marginal high)	66.13 (marginal high)

Success Rate

The Phase II usability test on the success rate aspect recorded a success rate of 74.38%. This result represents an 11.87% decrease compared to the Phase I test results, which reached 86.25%. This decline in the success rate empirically reflects a more accurate real-world scenario, given that the Phase II evaluation involved 20 respondents with a broader demographic profile, including a group of students and seven rabbit farmers. The inclusion of farmers as real-world users introduced variations in digital literacy levels, which directly influenced the speed and success of adaptation to the new system, consistent with findings that well-designed Android- and web-based media can meaningfully improve users' information literacy skills, particularly for users with initially lower digital proficiency (Setyoko et al., 2023).

Based on the effectiveness standards of Home Affairs Research and Development standard (1991) on Putri et al. (2021), a score of 74.38% falls within the 60–79.99% range, which is classified as the "moderately effective" category. The stability of the success rate metric within this range demonstrates the robustness of the recording website interface in accommodating users with minimal exposure to technology. Design improvements implemented following Phase I evaluation – specifically replacing manual text input with dropdown options (as in Task T5) and integrating

calendar input – proved crucial in reducing navigation errors. These interface optimizations enabled respondents to complete the majority of task scenarios independently without requiring preliminary operational guidance.

Error

Measuring the error aspect using the defective rate parameter in Phase II yielded an average value of 12%. Referring to Sauro & Lewis (2016), analysis of nearly 1,200 usability tasks across 115 usability tests, the average task-completion rate in industry practice is approximately 78%, implying an average task failure rate of around 22%. The error rate of 12% obtained in Phase II is therefore considerably lower than this general industry benchmark, indicating that the recording website performs above the typical standard for task-based digital applications.

A comparison with the results of Phase I testing shows that the defective rate increased by only 1%, from 11 to 12%. This minimal increase is a significant achievement, given that the group of respondent farmers consisted primarily of non-digital natives. Analysis through direct observation indicates that the errors that occurred were primarily due to users' independent exploration (trial and error) in navigating the recording website. Although used by respondents with limited digital literacy, the system proved capable of guiding users very effectively, keeping the error rate below the industry failure standard. This finding validates the robustness of the interface design in maintaining data input accuracy under field conditions.

Efficiency

Measuring efficiency using time-based efficiency parameters in Phase II testing yielded a value of 0.014 goals/sec. This figure is equivalent to an average task completion time of 66.91 seconds per scenario. This duration is slower than the results of Phase I testing, which recorded a time of 53.05 seconds. This slowdown in execution time was significantly influenced by demographic factors and the diversity of the second-phase respondent group's profiles. The inclusion of farmers as primary respondents had a significant impact on initial adaptation time, particularly in task scenarios requiring manual text entry, such as tasks 1 (T1) through 3 (T3). This finding is consistent with evidence from cassava farmers' evaluation of agricultural mobile applications, which showed that usability ratings for effectiveness and efficiency varied considerably depending on users' prior digital exposure, even when the underlying application functioned correctly (Adesiji et al., 2024). Similarly, in a usability study of map-based agricultural applications,

task success rates among smallholder farmers were found to be highly sensitive to interface complexity, with simplified designs consistently outperforming feature-rich alternatives among less digitally experienced users (Bartling et al., 2022) – a pattern that mirrors the demographic-driven decline in success rate observed in Phase II of the present study.

The initial familiarization phase proved to be the largest contributor to the overall operational duration. The test data also revealed a positive learning curve as the duration of interaction increased. This adaptive capability is empirically documented in individual performance records, such as that of the third respondent (R3), who was able to reduce the completion time for the seventh task (T7) to just 18 seconds. Users' information retention builds progressively through the mechanisms of exploration and error correction from previous tasks. The task completion time on this recording website is ultimately still considered far more efficient when compared to conventional recording methods. The digital system is capable of automatically processing and analyzing data, whereas manual recording on livestock cards requires farmers to perform separate data calculations before the writing process.

Satisfaction

Satisfaction levels in Phase II were measured using the SUS questionnaire administered to 20 respondents. The evaluation results recorded an average SUS score of 66.13, an increase from the Phase I score of 63.50. Although this figure remains statistically below the global average of 68, this increase indicates a positive trend in the system's acceptance by end-users. The score of 66.13 remains within the Marginal High (Grade D) category, representing an improvement from the Phase I score of 63.50. Although the system has not yet reached the Acceptable threshold of 68, this upward trend indicates a positive trajectory in user experience following the implementation of design revisions. A similar pattern has been reported in other interface-redesign studies, where iterative refinement raised SUS scores from an unacceptable to an excellent category (Septiadi & Sukmawati, 2025), suggesting that continued iterative refinement of the recording website could similarly move its SUS score beyond the acceptable threshold.

This increase in scores demonstrates the effectiveness of improvements to the recording website interface, particularly through the optimization of the workflow for the fifth task (T5). The transition from a manual input mechanism to an intuitive dropdown system has significantly contributed to the perception of ease of use. Users felt they did not need to perform

complicated procedures (referring to SUS questionnaire item number 2) or learn many technical details before operating the system (referring to SUS questionnaire item number 10). The system's success in improving satisfaction scores among livestock farmer respondents with varying levels of digital literacy indicates that the design development strategy has been able to better accommodate user needs compared to the previous version. A comparable pattern has been reported in the development of livestock management applications elsewhere; a mobile application for fattening beef cattle farm management, developed through a similarly iterative user-centered design process, achieved a mean SUS score in the "Good" category following successive rounds of interface refinement (Thannithi et al., 2024), reinforcing the view that usability gains in agricultural recording systems typically emerge through iteration rather than a single design cycle.



Figure 4. Usability testing phase II with farmers

Conclusion

This study successfully developed and evaluated the usability of a rabbit livestock recording website through an iterative design process based on The Five Planes framework, involving groups of animal science students and active rabbit farmers as end-users. Usability evaluation referring to ISO 9241-11:2018 showed that interface optimization through iterative improvements was able to increase the system's acceptance rate and maintain performance stability even when operated by respondents with varying levels of digital literacy. Detailed conclusions for each usability dimension are outlined as follows: This study successfully developed and evaluated the usability of a web-based rabbit reproduction recording system using The Five Planes framework, with usability assessed through ISO 9241-11:2018 across effectiveness, efficiency, and satisfaction dimensions; The success rate reached 86.25% in Phase I ("very effective" category) and declined to 74.38% in Phase II ("moderately effective" category) following the inclusion of farmer

respondents with more heterogeneous digital literacy; rather than indicating a decline in system quality, this shift reflects a more realistic field-testing condition and highlights that further interface refinement is still needed to accommodate users with lower digital literacy; Task completion time increased from 53.05 seconds in Phase I to 66.91 seconds in Phase II, yet the system remained considerably more efficient than conventional manual recording methods, which require farmers to perform separate data calculations before writing. The operational error rate rose only marginally, from 11% to 12%, and remained well below the general industry failure-rate benchmark of approximately 22%, indicating that the dropdown and date picker features introduced after Phase I were effective in reducing manual data-entry errors even among less digitally literate users; User satisfaction, measured through the SUS, improved from 63.50 to 66.13, with both scores falling within the Marginal High category – an encouraging trend that has not yet reached the acceptable threshold of 68, underscoring the need for continued interface refinement; Taken together, these findings indicate that while The Five Planes framework produced a functionally robust recording website, further usability improvements – particularly in simplifying workflows and terminology for users with lower digital literacy – are necessary before broader implementation among smallholder rabbit farmers. These results reinforce recommendations from the broader digital agriculture literature that interface simplification, local-language support, and reduced cognitive load are essential design priorities when serving users with heterogeneous digital literacy. Future research is recommended to involve a larger and more balanced sample of farmer respondents, to conduct longitudinal testing that captures learning-curve effects over time, and to explore targeted interface adaptations for users with limited digital literacy. In conclusion, this study successfully developed and evaluated a web-based rabbit reproduction recording system using The Five Planes framework and ISO 9241-11:2018. To ensure sustainable field adoption, future research should prioritize interface simplification, reduced cognitive load, and local-language support, alongside longitudinal testing with larger farmer cohorts and targeted interface adaptations.

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Resources, conceptualization, methodology, investigation, data curation, formal analysis, writing—preparation of the

original draft, I.F.A.H. and S.M.; writing—review and editing, validation, M.H.N., O.S., and H.T.

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Conflicts of Interest

The authors declare no conflict of interest.

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